Santa Clara Valley Water District SM

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Guidance on Alternative Evaluation and Selection for Natural Flood Protection Projects

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Guidance on Alternative Evaluation and Selection for Natural Flood Protection Projects

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Foreword

In November of 2000 the voters of Santa Clara County approved a ballot measure to fund the Clean, Safe Creeks and Natural Flood Protection Program with a special tax. The Santa Clara Valley Water District developed the term "natural flood protection" during the formation of this Program. The term articulates the District's updated mission to provide water resources management in an environmentally-sensitive manner. It also reflects the multiple objectives that a properly managed river corridor can support.

> "It is an important characteristic of a natural channel to accept both high and low flows with their associated sediment load without long term changes in morphology."
>
> -Dr. Luna Leopold; Water, Rivers and Creeks, 1997

A river has energy to convey water and sediment, supporting a dynamic web of life. A superior river corridor design accommodates the transport of water and sediment while supporting the ecological functions. Earlier flood protection works were typically designed to convey large amounts of clean, sediment-free water. We now know that understanding and addressing the major factors of water and sediment conveyance, ecological processes and community needs such as recreation, is critical to ensuring a project's success. The framework presented in this document provides guidance to planning teams to achieve a balance between natural resource protection, property protection, community benefits and costs. It provides guidance by articulating the ideal project from a variety of perspectives, allowing the project team to optimize the balance of multiple objectives.

The Clean, Safe Creeks and Natural Flood Protection program reaffirms the District's long-standing commitment to a broad set of objectives for creek projects. The objectives are not new to the District. However, organizing and clarifying the multiple objectives that the District strives to achieve, and applying a consistent method of decision-making is a new approach, aligned with the ISO standards of documentation and performance. To satisfy the reporting requirement for the Board-appointed Independent Monitoring Committee, the evaluation framework presented here standardizes the method by which those multiple objectives will be evaluated.

Policy Basis

The evaluation framework provides guidance to implement the Board's Ends Policy E-2.2 "There is reduced potential for flood damages." The full policy

provides the basis for a multiple objective evaluation system, with measurement criteria provided through CEO interpretation of this policy. The full texts of the policy is:

2.2. There is reduced potential for flood damages.

2.2.1. There is natural flood protection that balances environmental quality, community benefit and protection from creek flooding in a cost effective manner. In providing flood protection, balance the following multiple objectives:

2.2.1.1. Homes, schools, businesses, and transportation networks are protected from flooding and erosion.
2.2.1.2. Ecological functions and processes are supported.
2.2.1.3. Physical stream functions and processes are integrated.
2.2.1.4. Maintenance requirements
2.2.1.5. Projects are integrated within the watershed as a whole.
2.2.1.6. The quality and availability of water is protected.
2.2.1.7. Cooperation with local agencies achieves mutually beneficial goals.
2.2.1.8. Community benefits beyond flood protection
2.2.1.9. Life-cycle costs are minimized

The CEO interpretation of “natural flood protection” is:

> *A multiple-objective approach to providing environmental quality, community benefit and protection from creek flooding in a cost effective manner through integrated planning and management that considers the physical, hydrologic and ecologic functions and processes of streams within the community setting.*

The Board’s direction to balance the nine objectives specified in the policy does not indicate a priority ranking of objectives, therefore overall weighting of these objectives will be determined on a project-specific basis. Setting weights will be a collaborative effort between District staff, the watershed manager and, when appropriate, the community affected by the project.

The evaluation framework with its associated descriptions and measurable criteria is presented as additional CEO Interpretation of Board Policy. As CEO Interpretation, the framework provides guidance to staff on how to implement the District Board’s Governance Policies.

Ultimately, the District Board of Directors will decide how best to balance the benefits and costs of a specific project, including whether to approve a specific flood protection project within a given community. The decision is based on an assessment of community values, industry standards, and an appropriate balance of project benefits and costs. The evaluation framework provides a standardized method to display the relative merits of each alternative, allowing the Board and public to discuss balances and tradeoffs inherent in providing natural flood protection in a populated environment.

Overview of Evaluation Framework

The alternative evaluation framework provides guidance to staff by means of internally consistent, tiered elements. These elements provide a framework for evaluating flood protection projects. The elements are:

1. A description of natural flood protection
2. A set of objectives that collectively describe natural flood protection

} Board Ends Policy

3. A set of criteria to measure each objective
4. A standardized rating scale that guides evaluation of each criterion

} CEO Interpretation

The description, objectives, and rating criteria are presented on the following pages. The individual rating scales – guidance for standardized rating of each criterion - are presented as Sections One through Nine of this document, corresponding to the nine objectives.

Natural Flood Protection Description, Objectives and Criteria

Description

Providing environmental quality, community benefit and protection from creek flooding in a cost effective manner through integrated planning and management that considers the physical, hydrologic and ecologic functions and processes of streams within the community setting

Objectives

The following list of objectives is not presented in priority order. They are tied specifically to Board Ends Policy 2.2.1.1 through 2.2.1.9, and are numbered 1 through 9, accordingly. Relative weights for the objectives will be determined specifically on a project-by project basis.

1. Homes, schools, businesses and transportation networks are protected from flooding and erosion.
2. Ecologic functions and processes are supported.
3. Physical stream functions and processes are integrated.
4. Maintenance requirements (are minimized).
5. Projects are integrated within the watershed as a whole.
6. The quality and availability of water are protected.
7. Cooperation with other local agencies achieves mutually beneficial goals.
8. Community benefits beyond flood protection.
9. Life-cycle costs (are minimized).

Each objective is measured through evaluation of one or more criteria. Each criterion is assessed against a standardized scale. These are presented in Sections One through Nine of this document. Individual criteria are presented below, with brief explanations of what they assess. The rating guidance sheets presented later in this document provide more detailed descriptions of the attributes being measured and also provide examples of exceptional achievement.

Objective Topics, Described

1. flood protection
Focuses on providing protection to lives and property against the potential damages from flood events.

2. ecology
Examines the potential to protect, enhance, or restore the natural resource benefits of streams and the watershed in ecological terms.

3. geomorphology/ stable channel
Addresses the ability to effectively manage water and sediment from the watershed under both extremely high flows and routine low flows.

4. maintenance
Focuses on minimizing the long-term obligation of operating and maintaining projects once they are constructed.

5. watershed context
Assesses how appropriate a project is to its location within the watershed and the physical, ecological and social contexts.

6. water quality and quantity
Addresses water-supply related goals, including quality and quantity of surface and groundwater associated with streams.

7. local partner agencies
Measures how effectively a potential project meets goals of both the District and the partner communities/ agencies affected by the project.

8. community benefits
Addresses the full range of community benefits beyond flood protection that might be integrated into a creek project.

9. life-cycle costs
Examines project costs as a long-term investment rather than a one-time cost.

Criteria

Objective 1: Homes, schools, businesses and transportation networks are protected from flooding and erosion (E-2.2.1.1.)

1.1. Safety
Protection of public safety if conditions exceed design assumptions

1.2. Economic protection
Protection from damage due to floodwater, erosion or sediment for homes, schools, businesses, transportation systems and other infrastructure

1.3. Durability
Future District effort required to maintain design level of protection

1.4. Resiliency
Adaptability to future changes external to District activities

1.5. Local drainage
Support of local storm drain systems

1.6. Time to implementation

Objective 2: Support ecologic functions and processes (E-2.2.1.2.)

2.1. Meets local habitat goals
Ability to meet habitat goals as defined from examining the watershed as a whole and accounting for opportunities and constraints specific to the project area

2.2. Quality of habitat
Quality of habitat provided by alternative

2.3. Sustainability of habitat
Intensity of future human intervention required to maintain the target habitat quality; opportunity for habitat to self-adjust appropriately to future change

2.4. Connectivity of habitat
Integration of habitat elements into surrounding habitat landscape and within project area

Objective 3: Integrate physical stream functions and processes (E-2.2.1.3.)

3.1. Floodplain
Inclusion of an appropriately-sized overflow area within the flood conveyance corridor that effectively conveys high flows and dissipates erosive energy (“multi-stage” channel)

3.2. Active channel
Appropriateness of size and configuration of the active channel relative to watershed inputs and reach characteristics

3.3. Stable side slopes
Stability of channel side slopes using geotechnical or biotechnical methods

3.4. Upstream/ downstream transitions
Stability of channel's integration with upstream and downstream reaches

Objective 4: Minimize Maintenance Requirements (E-2.2.1.4.)

4.1. Structural features
Maintenance requirements associated with structural features within project corridor

4.2. Natural processes
Maintenance requirements associated with vegetation growth, erosion and sediment processes

4.3. Urban flows
Maintenance requirements resulting from smaller, high-frequency storm events and outfall flows

4.4. Access
Incorporation of adequate access for maintenance crews and equipment

Objective 5: Integrate within the context of the watershed (E-2.2.1.5.)

5.1 Meets local watershed goals
Ability to meet watershed goals as defined in a process that examines the watershed as a whole and accounts for opportunities and constraints specific to the project area

Objective 6: Protect the quality and availability of water (E-2.2.1.6.)

6.1. Water availability
Impact on ground-water recharge

6.2. Groundwater Quality
Groundwater quality protection from contamination and the threat of contamination by preventing contaminant entry into groundwater

6.3. Instream water quality
Water quality protection through vegetation and instream hydraulic complexity

6.4. Offstream water management
Ability to enhance water supply and quality and reduce peak flows through local retention of rainfall and pollution prevention programs

6.5. Flow Regime

Ability to maintain geomorphically and biologically appropriate range of flows – Quantity and Timing

Objective 7: Cooperate with other local agencies to achieve mutually beneficial goals (E-2.2.1.7.)

7.1 Mutual local goals
Ability to achieve the project-specific goals and objectives developed jointly by the District and local agencies

7.2 Supports General Plan
Ability to support goals and policies as stated in general plan of partner agencies

Objective 8: Maximize community benefits beyond flood protection (E-2.2.1.8.)

8.1. Community safety
Overall safety for appropriate access and recreation

8.2. Recreation
Quality of recreation experience provided by alternative

8.3. Aesthetics
Quality of aesthetic form provided by alternative

8.4. Social and cultural benefits
Opportunity through programs or physical features to promote community involvement

8.5. Local economic effects
Potential effects on property values and/or local business climate

8.6. Green construction and operation
Reflection of the District's commitment to minimize its impact on the environment

8.7. Open space
Incorporation of open space into alternative design

8.8. Community input
Alternative reflects community-developed objectives / ideas

Objective 9: Minimize life-cycle costs (E-2.2.1.9.)

9.1. Capital cost
Net Present Value of estimated capital cost

9.2. Maintenance cost
Net Present Value of all maintenance costs over the life of the project

9.3. Grant or cost-sharing opportunities

Net Present Value of grant or cost-sharing opportunities for project or project components

Background

Purpose

In developing new flood protection projects, it is necessary to have a specific description of “natural flood protection” with clear objectives and measurable criteria.

The evaluation framework presented here provides a standard means of evaluating potential flood protection projects (alternatives) for their ability to achieve the multiple objectives that comprise our understanding of “natural flood protection.” With a clear and consistent framework for assessing possible alternatives, the selection of the most suitable alternative is standardized.

When a new flood protection project is planned, the team formulates several approaches. These are called alternatives. At first, they are roughly described and called conceptual alternatives. As the team collects more information, some alternatives are eliminated because they are impractical or ineffective, and some remain on the table for further development. Those remaining few are called feasible alternatives.

The ultimate goal of a planning study, which includes engineering, geomorphic and environmental studies, is to identify the most acceptable of the feasible alternatives to move forward into design and construction. This decision process is dependent on comparing alternatives to clearly identify the one that best meets the project objectives, the desires of the community, and minimizes net impacts to the enviroment. This evaluation framework provides a consistent format with a clear set of objectives and measurement criteria, allowing different alternatives to be easily compared. For decision-makers, stakeholders and the public, this framework also illuminates the tradeoffs inherent to providing natural flood protection in our community. In concert with the evaluation approach presented with this framework, a complete analysis under the California Environmental Quality Act (CEQA) is required. The multiple-objective approach outlined in this framework is compatible and complementary to the required CEQA analysis of potential project impacts.

Alignment with Other Agency Guidance

The multi-objective approach to planning flood protection projects outlined with this CEO interpretation aligns with recommendations made by the California Floodplain Management Task Force (California Floodplain Management Report, December, 2002. Available on the web at fpmtaskforce.water.ca.gov). The Task Force was appointed by Governor Gray Davis; District Board Director Zlotnick was a Co-Vice Chair. The report offers a series of recommendations on multi-objective floodplain management, compatible with the objectives outlined here.

The rating criteria were developed in recognition of recent guidance from the San Francisco Regional Water Quality Control Board (Technical Reference Circular W.D. 02-#1; “A Primer on Stream and River Protection for the Regulator and Program Manager”; available on the web at www.swrcb.ca.gov/rwqcb2 under technical reports). The objectives also support the Santa Clara Basin

Watershed Management Initiative's recently released Watershed Action Plan (August, 2003; available on the web at www.scbwmi.org/).

Collaborative Development of Evaluation Framework

The "natural flood protection" description and evaluation framework represent the result of a collaborative process to compile knowledge and experience from over fifty technical experts, both internal and external to the District. External participants included representatives from the environmental advocacy community, the San Francisco Regional Water Quality Control Board, local cities, the Guadalupe-Coyote Resource Conservation District, nonprofit science and watershed groups and the Environmental Protection Agency. Internal participants included forty-four technical staff from throughout the District. The process comprised twenty-one facilitated work-sessions, in which specific recommendations were collected, prioritized and developed into appropriate and useful measurement objectives and criteria. The final collection of objectives and criteria was reviewed by all participants - internal and external and presented to the Watershed Management Initiative (WMI) Core Group.

The project team would like to acknowledge and thank the individual members of the technical teams who worked positively and collaboratively toward defining specific attributes of a "natural flood protection" project. The following page lists participants both internal to the District and external. These people each attended several demanding working meetings, providing input and guidance as this framework was developed.

Technical Participants

District Staff	Unit	Division
Jae Abel	Ecological Services	WMD
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Frances Brewster	Water Quality	WU
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CLEAN South Bay
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Robin Grossinger

San Francisquito Watershed Council
Katie Pilat

Silicon Valley Mfg Group
Margaret Bruce

Applying the Evaluation Framework --

Weighting and Rating

The framework is sufficiently flexible to provide guidance at three distinct stages of the capital project planning and implementation process.

Guidance for Planning Projects
The objectives and criteria, particularly the criteria rating guidance, clearly describe the functions and features of a successful natural flood protection project. This is extremely useful to a project team because bringing multiple objectives into focus at the beginning of the planning process is critical to developing an efficient and integrated project that balances the objectives.

Selection of Project Alternative
The evaluation framework provides a clear and repeatable method for comparing and selecting alternatives during the CEQA/NEPA/Engineering Feasibility phase of a planning study. It provides a method of evaluating how each feasible alternative could support the goal of providing natural flood protection. The organized system allows for a broad-scale comparison of potential alternatives as well as a more detailed examination of individual components of each alternative. This assists staff, decision-makers, stakeholders and the general public in viewing and evaluating the tradeoffs and balances that are inherent to providing natural flood protection in a populated environment.

The evaluation framework also provides a clear means of assessing existing conditions, known as the “No Project” alternative. Comparing the baseline condition to the proposed alternatives will highlight how and where improvements to the existing creek system might best be implemented.

Weighting

Customizing Framework – Designating Weights for Specific Applications / Individual Communities

The evaluation framework itself is dimensionless and does not provide a numeric score for any individual objective or for any project alternative as a whole. The framework neutrality retains the required flexibility to support the appropriate objectives, given the opportunities and constraints for each specific area in which projects are proposed. It does this by providing a means to accept relative weights for individual objectives based on watershed and community characteristics.

Relative weights for each objective (for example: High, Medium, Low or N/A) will be developed and incorporated into the alternative evaluation framework on a project-specific basis. This will provide greater guidance to planning staff, by indicating up-front which aspects should be given most emphasis in developing alternatives. It will also support an in-depth comparison between alternatives, in which valuing certain objectives over others will facilitate making a supportable decision.

Another feature of the framework is that additional objectives or criteria can be added to the system for individual projects. These would be based on

watershed and community characteristics and project opportunities, and could be incorporated directly into the evaluation framework. The base framework provides a simple format that should be used for any supplemental objectives or criteria that might be added.

Establishing Relative Weights for Objectives

There are three distinct steps to developing project-specific weights for the nine objectives. In summary:

1. Initial relative weights (high, medium, low importance or not applicable) for each of the nine objectives are set by the project team in cooperation with the Watershed Manager.

2. The weights are fine-tuned by the community being served, through project-specific advisory committees, community meetings, local agency meetings, etc., as appropriate.

3. The relative weights are approved by the Board, providing staff a firm guideline for alternative selection and development.

The implementation of these three steps is discussed below.

During the initial development of the Project Plan, the appropriate Watershed Manager will work with the project team to establish two important parameters:

- Specific Project Goals – these are largely used in the development and winnowing of *conceptual alternatives*.

- Relative weights for objectives – these are used in the development, comparison and selection of *feasible alternatives.*

Specific Project Goals Are Used For Conceptual Alternatives

Typically, the specific project goals will have already been set, for instance by the Clean, Safe Creeks and Natural Flood Protection Program. They might include (for example) protection up to the 1% flood for a specific number of parcels, in a specified area for a specified budget. These are considered "given" and are not subject to change without substantial discussion. Specifying the project goals allows the project team to screen a wide and diverse range of conceptual alternatives (generally 10 – 20) down to a smaller set of feasible alternatives (generally 4 – 8).

The first-cut winnowing of conceptual alternatives will focus on the ability of potential project approaches to meet the *specific project goals*. The nine "natural flood protection" objectives are used at this stage merely for guidance, while the specific project goals are closely followed. Thus, for instance the objectives of "providing flood protection" and "minimizing life-cycle costs" might have more influence in this initial round of selection than at a later round, when more subtle differences between feasible alternatives will be examined. Project alternatives that meet the specific project goals will have been deemed feasible in terms of cost, technical feasibility and solving the appropriate problems.

Relative Weights Of Objectives Are Used For Feasible Alternatives

Project-specific relative weights for the objectives (High, Medium, Low or N/A) will be used for evaluation/selection between the much smaller set of *feasible alternatives* (generally 4 – 8 total).

When the alternatives have been narrowed to those most feasible, the nine objectives and their assigned relative weights will be used in a more systematic and detailed manner, as outlined in this document. The relative weights (High, Medium, Low or Not Applicable) will be more reflective of choosing between several feasible alternatives, all of which would address the basic problems that the project is intended to resolve (the specific project goals).

The community outreach element of the planning process should guide the "fine-tuning" of the relative weights (Step 2, above). The project planning team will consult with the Watershed Manager on adjusting the initially-assigned relative weights based on input from the community, public meetings, local agency input and/or technical advisory teams. The alternatives comparison matrix can then emphasize established values by presenting the objectives according to their relative importance.

Alternatives will be developed and subsequently compared based primarily on higher-value objectives, with the lower-valued objectives providing valuable information regarding balances and tradeoffs. As early as practical, but prior to finalizing the Engineer's Report or CEQA investigations, the relative weights as established in this process will be presented to the District's Board of Directors (See step 3, above). This will allow the elected Board members to view the factors that will most heavily guide the development, selection and evaluation of alternatives, prior to the expenditure of significant time and resources on detailed engineering and analysis.

Ultimately, the Santa Clara Valley Water District Board of Directors must decide what factors are most important in approving an alternative for a flood control project. However, the Board is best prepared to make these decisions when well-informed on the project-specific values of the community being served. The Board can then support those values through project implementation decisions. The evaluation framework and associated documentation provide a standard view of the degree to which objectives are met by each alternative. The Board – and the public - can use this to evaluate the merits of each alternative and discuss them within a broader understanding of the tradeoffs and implications.

Rating

Use of the Evaluation Framework for Alternative Selection

Some of the criteria are quite technical in nature and specific expertise will be required to properly evaluate the alternatives. The rating team should be familiar with local conditions and constraints, and they should have access to project documents and results from community outreach efforts. The rating team may consist of a few members of the planning/engineering/environmental team plus a few members of the project QA/QC team plus a representative of the Watershed Manager, for example.

Step 1: Rating Alternatives on Individual Criteria

Each criterion has an individual rating scale which provides specific guidance to the project rating team, defining a customized scale from outstanding to unacceptable. Each customized scale provides guidance for rating specific attributes, based on recommendations from the technical collaborators both internal and external to the District. The standard format for the rating scale is illustrated in Figure 1, in the form of an example rating sheet. A customized rating scale for each criterion helps to assure consistent ratings, even on subjective criteria.

Within the individual objectives, criteria are pre-weighted to facilitate developing a single rating for the objective. It is possible, through consensus of the technical and/or outreach team(s), to modify these "default" preset criteria weights. While possible, this approach is not recommended, as the purpose of pre-designating weights is to avoid asking the community or the technical advisors to examine the relative importance of some forty criteria. Their efforts should instead focus on determining the project-specific relative importance of the nine objectives.

Appendix C contains appropriate forms for the criteria rating and justification process.

Step 2: Rating Alternatives on Nine Objectives

The criteria ratings for each individual objective are assimilated into a summary objective rating. This is done with the aid of pre-set weights for the individual criteria within a given objective. The weights are set only within the context of the objective that they support. The criteria weights do not carry forward toward rating the alternatives as a whole, because individual objectives will be weighted differently for each project. Figure 2 illustrates a hypothetical comparison rating of four alternatives for a single objective with six criteria.

In some cases, a single criterion with a rating of "unacceptable" could translate up to an objective or even an alternative rating of "unacceptable." An alternative that receives this rating does not meet the most basic project objectives, or would violate state or federal standards and should not be considered further. *Generally, these types of alternatives would be eliminated early in the planning process, at the conceptual alternatives stage.* The planning team should be aware of factors that would eliminate a project alternative from further consideration.

Appendix D contains forms for summary ratings for each objective.

Step 3: Overall Alternatives Comparison Matrix

Finally, the summary rating for each objective is reported on an alternatives comparison matrix. The matrix includes the summary rating for all objectives, for each alternative. The matrix offers a concise and standardized means to compare project alternatives, simplifying a complex analysis into a single, visual synopsis. A hypothetical alternatives comparison matrix for this system is illustrated in Figure 3. An example of a typical alternatives comparison matrix under the District's previous evaluation system is presented as Figure 4 for comparison to this updated system.

Appendix E contains the Alternative Comparison Matrix Form.

One of the benefits of this system is that it will highlight potential optimizations and tradeoffs. Additionally, because supporting material is available at three distinct levels (criteria, objective and summary matrix), reviewers can examine projects and project attributes in as much or as little detail as desired.

Documenting Rating Decisions

When evaluating alternatives, the evaluation team must support each rating decision. This could be a brief reference using the terms contained within the rating guidance sheet itself, or it could be an explanation of the decisions and tradeoffs reflected in the proposed design. Documenting each rating on the forms provided (Appendix C) offers an organized means to describe each alternative in standard terms, further illuminating tradeoffs and cross-benefits. Figure 5 presents an example of an alternative rating documentation and justification table for one objective. A similar table would be prepared for each of the nine objectives, for each alternative. The complete set of rating documentation and justification tables will provide a complete and standardized summary of important attributes for each alternative. Appendix C contains blank rating documentation and justification tables for each of the nine objectives.

Cross-Benefits of Supportive Criteria

Most of the criteria within this framework support more than a single objective. The optimum project design is not a collection of some forty individual features, but a simple and integrated system in which major design elements support the functions and processes of other elements. One example is objective 3, which promotes a self-sustaining, regionally appropriate geomorphic design. If the channel is designed in harmony with the hydraulic and sediment transport elements of the watershed, it will in turn support higher quality habitat (objective 2), have lower maintenance requirements (objectives 4 and 9), support the watershed functions as a whole (objective 5), support water quality protection goals (objective 6) and likely provide recreational or other community benefits (objective 8). Clearly, many of the criteria support one another; although some do conflict. The classic example of conflict is the inherent tension between providing pristine habitat and providing recreation opportunities (objectives 2 and 8).

Appendix F presents a simple Support/Conflict matrix that provides an overview of which criteria support others. The matrix presents a picture of the interrelatedness of the objectives and criteria. With forty criteria, there are close to 800 combinations of criteria, one compared to another. On balance, 97% of the criteria combinations are either mutually supportive or neutral, with only 3% of the criteria combinations subject to inherent conflict. The most supportive criteria indicate project aspects that will provide strong benefits across a broad range of measures. Conversely, conflicting criteria give a preview of where balances and tradeoffs may need to be made. This information supports an integrated and holistic design approach to achieving many objectives by optimizing some of the most basic ones.

Implementing the CEO Interpretation

Achieving natural flood protection will require capital planning work to include appropriate geomorphic and ecologic/biotic studies to analyze the unique conditions of the creek within its watershed. It will also require inclusion of the community in the planning process to capture and incorporate local community values and relative importance of the objectives. This work is already underway for many planning projects. The CEO Interpretation facilitates an efficient and uniform application of those principles.

This document is available electronically in the Office of Watershed Operations' ISO/QEMS on-line document repository (as WW75125 – a level three, work-instruction document). It is incorporated by reference into the Capital Program Services Division's project planning process (document number W73002 "Planning Phase WBS").

Objective 1: Provide protection from flood damage

Criterion 1.1 Safety	Assesses: Protection of public safety if conditions exceed design assumptions

Rating Guidance

● Outstanding	**Alternative continues to provide for public safety when flows exceed design flow or if design assumptions prove inaccurate. For example:** a) Overall, flood hazard is reduced relative to no-project condition up to 500-year event; b) Alternative does not contain features susceptible to catastrophic failure for flows larger than design flow (up to 500-year event). Examples: top of flood conveyance channel is at or below adjacent grade, relocation and/or flood-proofing incorporated; c) Failure of alternative or flows in excess of design flow would result in only "nuisance flooding"; d) Alternative includes means to reduce peak flows; such means would continue to function for consecutive storms.
◒ Adequate	**Alternative improves safety compared to existing conditions when flows exceed the design flow or if design assumptions prove inaccurate. For example:** a) Same as "a" above to a lesser extent (e.g. 200 year event); b) Structural features of alternative that are subject to failure from high flows are designed to fail in a known and safe way (design a weak link into system for safety); c) Failure of alternative or flows in excess of design flow would not impact emergency vehicle access; would not result in fast-moving or deep water in developed areas; d) Alternative includes means to reduce peak flows; such means would not detract from function of alternative if consecutive storms occurred.
○ Poor	**Alternative provides safety only up to design flow** a) Overall, flood hazard is unchanged relative to no-project condition for flows exceeding design flows b) Damage/hazards resulting from conditions exceeding design assumptions (e.g. flows exceeding design flow) have not been assessed. c) Failure of alternative or flows in excess of design flow would not impact emergency vehicle access; would not result in fast-moving or deep water in developed areas.
X Unacceptable	a) Overall, flood hazard is increased relative to no-project condition for flows exceeding design flows. b) Flows exceeding design flows present risk of catastrophic failure of structural elements, causing risk to health & safety c) Failure of alternative or flows in excess of design flow would result in fast-moving or deep water in developed areas; major disruption of transportation network

Figure 1: Example rating scale, providing guidance for evaluation of a single criterion. Customized rating scales such as this have been developed for each of the forty criteria.

Objective Rating Matrix

Objective 1: Provide protection from flood damage								
Outstanding	Very Good	Adequate	Fair	Poor	X Unacceptable			
Alternative	**Criteria and Weights**							**Summary Rating**
	Safety (30)	**Economic Protection (30)**	**Durability (10)**	**Resiliency (10)**	**Local Drainage (10)**	**Time to Implementation (10)**		
Alternative 1								
Alternative 2								
Alternative 3								
Alternative 4								

Figure 2: This matrix shows a hypothetical example of the combination of all criteria from a single objective. Based on pre-determined weights, the Summary Rating is compiled for each Alternative. This Summary Rating will then be presented in an Alternatives Comparison Matrix.

Blank matrices for each objective can be found in Appendix D.

Alternatives Comparison Matrix

● Outstanding ◕ Very Good ◒ Adequate ◔ Fair ○ Poor X Unacceptable

Alternative	Objective								
	Protection from Flood Damage	Ecological Functions	Channel Functions	Maintenance	Integrated with Watershed	Water Quality & Availability	Other Agency Support	Community Benefits	Life-Cycle Costs
Alternative 1	◕	◒	◒	◕	◒	◔	◒	◕	$NPV
Alternative 2	◒	◔	◕	◒	◔	◒	◔	◒	$NPV
Alternative 3	◔	◕	◒	◒	◕	◕	◒	◕	$NPV
Alternative 4	◒	◒	◕	◔	◔	◔	◒	◔	$NPV

Figure 3: This example Alternatives Comparison Matrix shows the Summary Ratings for each of the nine objectives for four different Alternatives.

A blank Alternatives Comparison Matrix can be found in Appendix E.

Comparative Summary of Feasible Alternatives (Previous System)

Issues and Concerns	Widened Gabion Channel with Mitigation Bench	Gabion Bypass Channel	Earth Bypass Channels (East and West Banks)
1. Project Cost			
A. Right of Way	$ 4.8 million	$ 4.8 million	$10.2 million
B. Construction	$ 4.1 million	$ 4.3 million	$ 3.5 million
C. Mitigation on site	$ 0.1 million	$ 0.0 million	$ 0.5 million
Mitigation off site	$ 1.5 million	$ 0.6 million	$ 0.0 million
D. Total Cost	$10.5 million	$ 9.7 million	$14.2 million
2. Physical Environment			
A. General Description	East bank would be excavated 5 feet above stream bottom and bank would be lined with gabions. Earth bench and gabion bank would be partially revegetated.	Natural stream channel would be undisturbed except at erosion sites. Parallel bypass channel to the east with gabion banks would be constructed.	Natural stream undisturbed except at erosion sites. Earth bypass channels would be constructed to the east and west.
B. Erosion	Revegetated bench area subject to possible erosion during high flows.	Existing erosion sites repaired. Decrease erosion in natural stream due to diverted flows.	Existing erosion sites repaired. Decrease erosion in natural stream due to diverted flows.
C. Sedimentation	Slight decrease in sedimentation due to east bank gabion lining.	Decrease in sedimentation due to decreased erosion in natural stream.	Decrease in sedimentation due to decreased erosion in natural stream.
D. Water Quality	Slight decrease in turbidity during high flows.	Decrease in turbidity due to decreased erosion in natural stream.	Decrease in turbidity due to decreased erosion in natural stream.
E. Maintenance	Improved access and less intensive maintenance.	Less intensive maintenance in the natural channel and moderately intense maintenance in the bypass due to sedimentation/erosion. Access to existing stream improved.	Less intensive maintenance in existing stream. Moderately intense maintenance in bypass channels.
3. Biological Environment			
A. Fish Habitat	Loss of upper bank habitat on east bank due to excavation. Dense revegetation on bench.	Habitat value of natural stream would increase due to decreased maintenance activities.	Habitat value of natural stream would increase due to decreased maintenance activities.
C. Wildlife Habitat	Loss of upper east bank vegetation. Dense revegetation on a portion of the bench. 0.9 acre impact, 0.6 acres revegetated on site, and 2.1 acres revegetated off site.	Habitat value in natural stream would improve due to less intensive maintenance. Loss of vegetation at diversion structure site. 0.3 acres impact, 0.9 acres revegetated off site.	Habitat value in existing stream would increase over time due to less intensive maintenance and expanded riparian corridor. Revegetation on bypass channel banks. 0.8 acres impact, 2.5 acres of revegetated on site.
4. Socio-Cultural Environment			
A. Right of Way	Loss of 23 properties. Right-of-way width of 220 feet.	Loss of 23 properties. Right-of-way width of 220 feet.	Loss of 41 properties.
B. Aesthetics	Would remove existing riparian vegetation on east bank, allow for some dense planting areas on bench, and create open space.	Would preserve natural riparian habitat and create open space.	Would preserve and expand natural riparian corridor, provide buffer between natural channel and development as per recommendation in City's Riparian Corridor Policy Study, and create open space.
C. Recreation Potential	Possible linear pathway on top of bank adjacent to Mackey Avenue.	Possible linear pathway on top of bank adjacent to Mackey Avenue.	Possible linear pathway on both east and west top of banks of the natural channel.

Figure 4: Previous system of alternatives comparison matrix. Matrix gave good information, but without standard rating criteria or a standardized format.

Rating Documentation and Justification Table

Alternative _____

Objective 1: Provide protection from flood damage

Summary Rating: _____

● Outstanding ◕ Very Good ◒ Adequate ◔ Fair ○ Poor X Unacceptable

No.	Criteria	Description	Assigned Weight	Assigned Rating	Comments / Justification
C1.1	Safety	Protection of public safety if conditions exceed design assumptions	30		
C1.2	Economic Protection	Protection from damage for homes, schools, businesses, transportation systems and other infrastructure	30		
C1.3	Durability	Future District effort required to maintain design level of protection	10		
C1.4	Resiliency	Adaptability to future changes external to District activities	10		
C1.5	Local Drainage	Support of local storm drain systems	10		
C1.6	Time to implement ation	Time to implementation relative to other alternatives	10		
				Summary Rating	

Figure 5: Example Rating Documentation and Justification Table. One table would be prepared for each objective, for a total of nine for each Alternative. If there are five Alternatives, a total of 9 x 5 or 45 talbes will be prepared, each with supporting documentation. Blank Rating Documentation and Justification Tables for each Objective can be found in Appendix C.

Criteria Rating Guidance

Introduction

The following nine sections provide guidance for rating the criteria that comprise the nine natural flood protection objectives. A rating guidance sheet has been developed for each of the forty criteria. The rating team will evaluate feasible alternatives against each criterion in an objective to arrive at a summary rating for each of the nine objectives. The summary objective ratings are then presented in the Alternatives Comparison Matrix (See Figure 3).

The rating guidance sheet provides standardized guidance for applying the ratings of Outstanding, Very Good, Adequate, Fair, Poor or Unacceptable to each of the criterion. The criteria weights provide guidance on combining the individual criteria ratings into a summary objective rating. (Figure 6 provides a guide to the criteria rating guidance sheets). The criteria rating should be documented using the Rating Documentation and Justification tables found in Appendix C. Each alternative should have a Rating Documentation and Justification table for each of the nine objectives. When all alternatives have been fully rated on all nine objectives, an Alternatives Comparison Matrix can be prepared (Figure 3). A blank Alternatives Comparison Matrix is available in Appendix E.

The criteria rating tables provide qualitative descriptions for four of the six rating categories. Two of the rating categories (Very Good and Fair) are always left blank, leaving the rating team an opportunity to designate a criterion that is esentially “in-between” categories that have been specified. Figure 6, below, demonstrates how the rating guidance sheets are designed.

Rating guidance sheets for all criteria were developed through a collaborative effort of eight technical teams, consisting of experts both internal and external to the District. Members of each team were selected for their known expertise in the specific topics outlined by the objectives.

Objective X: Title of Objective

CX.Y Criterion Number	Assesses: Provides a description of the criterion and what it should assess.

Rating Guidance	
● Outstanding ◕ Very Good ◒ Adequate ◓ Fair ○ Poor X Unacceptable	
●	**Outstanding** This section describes the attributes of an Outstanding project alternative. Such an alternative would match the ultimate intention of the criterion. Lists are generally provided to qualitatively describe an Outstanding project alternative, but are subject to interpretation by the project rating team. An Outstanding alternative typically greatly improves conditions as compared to existing conditions.
◕	**Very Good** This section is left blank, to provide the project team a means of rating an alternative that is in-between "Outstanding" and "Adequate" as described in the rating guidance sheet.
◒	**Adequate** This section describes the attributes of an Adequate project alternative. Such an alternative generally meets the intention of the criterion, but would not provide an impressive example of achievement. Lists are generally provided to qualitatively describe an Adequate project alternative, but are subject to interpretation by the project rating team.
◓	**Fair** This section is left blank, to provide the project team a means of rating an alternative that is in-between "Adequate" and "Poor" as described in the rating guidance sheet.
○	**Poor** This section describes the attributes of a project alternative that barely meets the intention of the criterion.
X	**Unacceptable** This section describes the attributes of a project that fails to meet the intention of this criterion. Depending on the importance of the criterion, it may eliminate the project alternative from further consideration, or it may simply result in a lower overall rating for the objective.

Figure 6: Guide to the criteria rating guidance sheets. This table explains how the rating guidance sheets are organized and how the rating team will use them to guide rating of individual criteria.

Objective 1

Provide protection from flood damage

This objective focuses on providing protection to lives and property against the devastation of large flood events, in support of Board policy that homes, schools, businesses and transportation networks are protected from flooding and erosion. This policy was echoed in the voter-approved Clean, Safe Creeks and Natural Flood Protection Program of 2000.

The level of flood protection seems deceptively simple to measure: is the design flow contained with adequate freeboard, and does the project meet FEMA requirements? Yet protecting a community from the devastation of flooding is a much more complex responsibility. Factors beyond the control or present knowledge of the design team will eventually occur. While it is not generally feasible to provide full protection against any foreseeable event, the design should continue to provide residual protection for events or occurrence beyond the design parameters. Plans that account only for the design event and neglect the actuality of larger events or of unforeseen occurrences could have catastrophic consequences – such as a levee failure. Such failures may pose conditions worse than they would have been without the project.

This evaluation system is not meant to replace standard District engineering and design practices such as choosing design flow or providing adequate freeboard or erosion protection. Rather, it elucidates those aspects of an alternative that would make for a better or worse project, allowing an informed selection between feasible alternatives.

The criteria for this objective collectively measure the longevity, durability and resilience of a flood protection project over time and also evaluate the benefits to public safety if an event larger than the design event occurs. The project should improve the safety of the local community; provide truly long-term benefits; minimize reliance on future funding sources; support foreseeable changes in the local watershed; and be compatible with local storm-drain systems that rely on the creek for stormwater management.

A project that can provide these assurances to the community will provide a safe means of flood protection over the long term. Individual criteria and their weights within this objective are:

1.1. Safety (30)
Protection of public safety if conditions exceed design assumptions

1.2. Economic protection (30)
Protection from damage due to floodwater, erosion or sediment for homes, schools, businesses, transportation systems and other infrastructure

1.3. Durability (10)
Future District effort required to maintain design level of protection

1.4. Resiliency (10)
Adaptability to future changes external to District activities

1.5. Local drainage (10)
Support of local storm drain systems

1.6. Time to implementation (10)

Appendix B-1 contains additional notes on the topics covered here.

Objective 1: Provide protection from flood damage

C1.1 Safety

Assesses: Protection of public safety if conditions exceed design assumptions.
Design assumptions include flows, n-values, hydrograph shape, watershed inputs, etc.

Rating Guidance

Outstanding	Very Good	Adequate	Fair	Poor	X Unacceptable

●	**Alternative continues to provide for public safety when flows exceed design flow or if design assumptions prove inaccurate. For example:** a) Overall, flood hazard is reduced relative to no-project condition for flows 1.5 times design flow; b) Alternative does not contain features susceptible to catastrophic failure for flows larger than design flow (e.g. up to 1.5 times design flow). Examples of acceptable features: top of flood conveyance channel/ design water surface is at or below adjacent grade, relocation and/or flood-proofing has been incorporated, there is no pressure flow in culverts; c) Failure of alternative or flows in excess of design flow would result in only "nuisance flooding" – not imperil safety or emergency vehicle access; d) Alternative includes means to reduce peak flows; such means would continue to function for consecutive storms.
◒	**Alternative improves safety compared to existing conditions when flows exceed the design flow or if design assumptions prove inaccurate. For example:** a) Same as "a" above, but to a lesser extent (e.g. 1.2 times design event); b) Structural features of alternative that are subject to failure from high flows are designed to fail in a known and safe way (design a weak link into system for safety); c) Failure of alternative or flows in excess of design flow would not impact emergency vehicle access; would not result in fast-moving or deep water in developed areas; d) Alternative includes means to reduce peak flows; such means would not detract from function of alternative if consecutive storms occurred.
○	**Alternative provides safety only up to design flow** a) Overall, flood hazard is unchanged relative to no-project condition for flows exceeding design flows b) Damage/hazards resulting from conditions exceeding design assumptions (e.g. flows exceeding design flow) have not been assessed.
X	a) Overall, flood hazard is increased relative to no-project condition for flows exceeding design flows. b) Flows exceeding design flows present risk of catastrophic failure of structural elements, causing risk to health & safety c) Failure of alternative or flows in excess of design flow would result in fast-moving or deep (over 2 feet) water in developed areas; major disruption of transportation

	network.

Objective 1: Provide protection from flood damage

C1.2 Economic Protection

Assesses: Protection from damage due to floodwater, erosion or sediment for homes, schools, businesses, transportation systems and other infrastructure

Rating Guidance

Outstanding	Very Good	Adequate	Fair	Poor	X Unacceptable

●	a) <u>If design flow is 1% or greater:</u> Alternative exceeds federal standards for flood protection facilities. Exceeds most FEMA requirements for Letter of Map Revision. Exceeds most Corps conveyance and structural requirements. <u>If design flow is less than 1%:</u> Exceeds most non-conveyance requirements of Corps and FEMA (structural, operational, geotechnical, etc.) b) Instream features of the project itself, including bed and banks, not subject to damage (i.e. erosion) from flows up to and including design flow.
◒	a) <u>If design flow is 1% or greater:</u> Meets federal standards for flood protection facilities. Meets all FEMA requirements for Letter of Map Revision. Meets all Corps conveyance and structural requirements. <u>If design flow is less than 1%:</u> Meets all non-conveyance requirements of FEMA/ Corps (structural, operational, geotechnical, etc.) Flows up to design flow are contained within project area. b) Instream features of the project itself, including bed and banks, may be subject to minimal, easily repairable damage (i.e. erosion) from design flow. Potential instream damage would not impact development or the community. c) If alternative does not meet FEMA Letter of Map Revision standards, flows up to design flow are contained within project area. Federal structural standards are met. Flows up to and including design flow would not enter buildings or disrupt transportation networks.
○	a) Flows less than the design flow may cause damage (i.e. erosion) to instream features, including bed and banks. b) Design flows are not contained within project area, but would not cause substantial damage ('nuisance flows' of less than one foot)
X	a) Flows less than the design flows would likely cause substantial damage to instream features, including bed and banks. (Such project would most

	likely have been eliminated during conceptual alternatives analysis phase.) b) Alternative would not meet Corps or FEMA requirements for structural stability or flow conveyance.

Objective 1: Provide protection from flood damage

C1.3 Durability

Assesses: Future District effort required to maintain design level of protection

Rating Guidance

● **Outstanding** ◕ **Very Good** ◒ **Adequate** ◔ **Fair** ○ **Poor** X **Unacceptable**

●	Level of protection is virtually independent of future actions: a) Designed to be virtually maintenance-free. b) Has a viable, easily permitable, practical Operation and Maintenance Plan. c) Protection does not rely on real-time intervention during a flood event.
◒	Level of protection is dependent on future actions; they are realistic to apply: a) Periodic maintenance specified in a defined cycle of 3 or more years between major activities. b) Operation and Maintenance Plan preserves capacity, but may have some complexity in permitting or implementation. c) If any, flood protection "intervention" mechanisms are automatically operated and meet FEMA standards (Section 65.10(c) of NFIP). Risk of intervention system failure has been evaluated and is acceptable from a safety perspective. Also see District Engineering Policy 3-250 "Guideline for Allowing Use of Flood Control Measures the Rely on Human Intervention or Operations Plan."
○	Level of protection is dependent on future actions; they would be difficult or costly to apply and sustain: a) Frequent maintenance specified – less than 3 years between major activities. b) Operation and Maintenance Plan preserves capacity, but difficult to permit or implement. c) Relies on real-time human intervention to provide flood protection; procedures are reliable and practical to implement.
X	Level of protection is dependent on intense level of future actions requiring extensive knowledge and preparation, making them subject to potential failure. a) Intense active maintenance required to preserve capacity – e.g. annual vegetation or sediment removal. b) Operation and Maintenance Plan difficult to permit or unacceptable to regulatory agencies, community. Relies on real-time human intervention to provide protection. Field crew review indicates necessary interventions would be impractical to implement.

C1.4 Resiliency	Assesses: Adaptability to future changes external to District activities (e.g. future development, vegetation growth)

Rating Guidance	
● Outstanding ◕ Very Good ◒ Adequate ◔ Fair ○ Poor X Unacceptable	
●	Channel design would accommodate additional (future) features that would allow for potential future increased capacity needs, including future vegetative conditions. There is an ability to add capacity, if needed, in the future without changing the basic design or land acquisition requirements. For example, the foundations of levees or floodwalls are adequate to support future add-ons, as may be required.
◒	Channel design conveys runoff as generated by full build-out of existing general plans.
○	Channel designed to convey runoff from existing development.
X	Channel design does not convey current design flows.

Objective 1: Provide protection from flood damage

C1.5 Local Drainage

Assesses: Support of local storm drain systems

Rating Guidance	
● Outstanding ◕ Very Good ◒ Adequate ◔ Fair ○ Poor X Unacceptable	
●	Alternative design improves local drainage (storm drain conveyance), where applicable, as determined by careful review of local drainage system for affected city including current and planned future improvements (i.e. “interior drainage analysis” shows improvement over existing local drainage operations, and to future operations if information is available. This would occur, for example, if water levels in the creek were reduced due to the project, allowing easier flow from stormdrains. Other approaches could have similar beneficial results. This level of analysis is typically done for a FEMA LOMR, but a preliminary analysis should be done for the alternatives to ensure that no unanticipated problems will be revealed during the LOMR analysis). Alternative does not inhibit or impose restrictions on flow or operations of local drainage systems.
◒	Alternative accommodates most existing local drainage inputs without causing temporary street flooding. Alternative does not exacerbate any existing problems with storm-drains and localized street-flooding.
○	Alternative accommodates local drainage, but may retard flows to creeks during high flow events, causing temporary “nuisance flooding” in local streets.
X	Alternative does not account for local drainage systems.

Objective 1: Provide protection from flood damage

C1.6 Time to Implement	Assesses: Time to implementation

Rating Guidance	
● Outstanding ◕ Very Good ◒ Adequate ◔ Fair ○ Poor X Unacceptable	
●	Least amount of time to implementation *compared to other alternatives.*
◒	Time to implementation is approximately equal with most other alternatives.
○	Longest time to implementation compared to other alternatives.
X	Indefinite time to implementation due to funding, regulatory restrictions or other complications.

Objective 2

Support ecologic functions and processes

This objective addresses the District's mission of watershed stewardship by examining a project's potential to protect, enhance or restore the natural resource benefits of streams and the watershed. The physical structure of a creek changes through space and time, depending on the position within the watershed and the watershed's history. Biological communities reflect those changes. When appropriate ecologic functions are identified and incorporated into a project, the reach can become a self-sustaining habitat mosaic with improved connections to surrounding habitats. A self-sustaining habitat would have the ability to successfully rebound after change occurs, whether natural or human-induced. Providing the means to support a natural assemblage of native species is a holistic and effective approach to providing the legally required support of special status local species.

Natural flood protection projects must be evaluated using site-specific target ecological functions and processes that have been established in the context of the watershed as a whole. When the term "appropriate" is used in the rating guidance, it refers to this level of understanding.

A project successful at meeting this objective may also provide benefits in other objectives; for example, healthy streamside vegetation provides channel stability, filters pollutants and moderates water temperatures.

The collection of criteria for this objective measure whether a proposed project would support locally and regionally appropriate habitat, if the habitat would be viable into the future, and if the habitat would be connected with nearby habitat areas. All the above must be based on a good understanding of the riparian system. Individual criteria are:

2.1. Meets local habitat goals (25)
Ability to meet habitat goals as defined from examining the watershed as a whole and accounting for opportunities and constraints specific to the project area

2.2. Quality of habitat (25)
Quality of habitat provided by alternative

2.3. Sustainability of habitat (25)
Intensity of future human intervention required to maintain the target habitat quality; opportunity for habitat to self-adjust appropriately to future change

2.4. Connectivity of habitat (25)
Integration of habitat elements into surrounding habitat landscape and within project area

Appendix B-2 contains definitions and descriptions of some of the concepts presented here.

Objective 2: Support ecologic functions and processes

C2.1 Meets Local Habitat Goals	Assesses: Ability to meet habitat goals as defined from examining the watershed as a whole and accounting for opportunities and constraints specific to the project area

Rating Guidance	
● Outstanding ◕ Very Good ◒ Adequate ◔ Fair ○ Poor X Unacceptable	
●	The alternative meets or exceeds local habitat goals established as described above.
◒	The alternative meets some local habitat goals, and is not in conflict with any habitat goals established as described above.
○	The alternative may conflict with one or more habitat goals established as described above.
X	The alternative is in conflict with a number of habitat goals established as described above. OR Habitat goals have not been created.

Note: A Watershed Stewardship Plan or similar management plan would be an example of a document that establishes habitat goals specific to the watershed area. Watershed Management documents should be developed with this as one end-use in mind. Other documents could be used by the project team to understand local habitat goals in order to establish an appropriate context in which to evaluate.

In 2005, Watershed Stewardship Plans were developed for the Lower Peninsula, West Valley and Guadalupe Watersheds. In 2002, a Watershed Stewardship Plan was developed for the Coyote Watershed.

In 2005, an historical ecological survey was completed for Santa Clara Valley.

These documents should provide adequate habitat context.

Objective 2: Support ecologic functions and processes

C2.2 Habitat Provided

Assesses: Quality of habitat provided by alternative

Rating Guidance	
● Outstanding ◕ Very Good ◒ Adequate ◔ Fair ○ Poor X Unacceptable	
●	The alternative would provide relatively undisturbed habitat composed of native plant species and features with a high potential to meet the needs (such as feeding, breeding, resting, movement, cover) for an appropriate and locally native assemblage of fish, amphibians, reptiles, birds, mammals and invertebrates in each phase of their life-cycle. Alternative addresses the special needs of endemic, endangered or special status species.
◒	The alternative would adequately support the needs for a locally appropriate assemblage of fish, amphibians, reptiles, birds, mammals and invertebrates in each phase of their life-cycle. Alternative addresses the special needs of endemic, endangered or special status species.
○	Alternative focuses primarily on the special needs of threatened and endangered species as required by appropriate regulatory agencies.
X	The alternative does not provide any habitat value, consists of paved areas or areas with no vegetation.

Objective 2: Support ecologic functions and processes

C2.3 Sustainability of Habitat

Assesses: Intensity of future human intervention required to maintain the target habitat quality; opportunity for habitat to self-adjust appropriately to future change

Rating Guidance

● Outstanding	◕ Very Good	◒ Adequate	◔ Fair	○ Poor	X Unacceptable

●	All of: a) Channel maintenance for capacity is projected to be minimal, allowing vegetation to develop, age and change naturally. b) Channel banks are projected to be dynamically stable in the long-term. c) Vegetative maintenance / intervention has been minimized. d) Vegetation expected to be self-sustaining with appropriate successional changes.
◒	All of: a) Channel capacity maintenance would require periodic selective thinning of vegetation. b) Same as “b” above. c) Some short-term intervention (i.e. ‘landscaping’) necessary (up to five years) to establish vegetation. d) Same as “d” above.
○	All of: a) Regular maintenance for channel capacity is anticipated, compromising vegetation’s ability to develop, age and change naturally. b) Channel bank is expected to remain stable overall, with potential areas of instability that would require periodic rehabilitation. c) Intervention (i.e. ‘landscaping’) necessary to maintain vegetation over long-term. d) Vegetation is self-perpetuating without appropriate successional changes.
X	a) Regular maintenance for channel capacity is anticipated, likely requiring major removal of vegetation. b) Unstable channel banks (erosion, deposition). Cross sectional instability expected over time. c) Frequent maintenance / irrigation of vegetation is necessary for vegetative survival (often indicating an inappropriate match of vegetation to soil/water conditions). d) Due to maintenance or instability, vegetation is not expected to be self-sustaining.

Objective 2: Support ecologic functions and processes

C2.4 Connectivity of Habitat	Assesses: Integration of habitat elements into surrounding habitat landscape and within project area

Rating Guidance	
● Outstanding ◕ Very Good ◒ Adequate ◔ Fair ○ Poor X Unacceptable	
●	a) Alternative provides a continuous riparian corridor along the length of the project and is appropriately integrated into the surrounding habitat mosaic. b) Creek and floodplain biological communities are connected laterally along the corridor (when upland biological communities exist). c) Fish passable, where appropriate.
◒	a) Alternative provides a contiguous, wildlife-accessible corridor connected to surrounding habitat mosaic, with much of the riparian corridor biologically intact. Artificial bridge connections between like habitat types may be necessary. b) Floodplain or bypass neither fully biologically connected to riparian zone, nor completely separated. c) Fish passable, where appropriate.
○	a) Alternative does not provide contiguous riparian wildlife corridor and is not connected to surrounding habitat mosaic due to lack of surrounding habitat (this may be indicated by long stretches of underground culvert or unvegetated corridor that are unattractive or impassable by local wildlife) b) Floodplain or bypass not biologically connected to riparian zone. c) Fish passable with use of ladders that will require future maintenance.
X	Alternative not integrated into surrounding habitat, although surrounding habitat exists. Removes existing connections. Not passable to fish if passage is appropriate.

Objective 3

Physical Stream Functions and Processes

While a strong impetus for proposing a facility on a reach of creek is to provide protection against the devastation of large floods, those floods occur relatively infrequently. A modified river corridor in a populated setting should provide protection from those rare but potentially ruinous events; however, that same river corridor must perform equally well in its daily task of conveying water and sediment from the hills to the bays. Over time, the smaller but more routine flows ultimately have a greater impact on a channel's stability and on water quality than do the rare but large events. Because of this, at least equal attention must be given to understanding the forces at work during routine flow events.

This objective addresses the ability of a proposed project to handle the "physical functions and processes" that occur in the watershed, both under the extreme pressures of a high-flow event and under the persistent demands of the more routine flows.

Among the most critical concepts covered in this section is that of a "dynamically stable" active channel. The active channel, also known as the bankfull channel, refers to the size of channel that carries most of the sediment of a stream over a long period of time. This may be a smaller channel within the overall flood conveyance corridor in a multi-phase channel. This is where the important pool and rifle habitats form and where most of the sediment transport occurs. It is the most dynamic portion of the stream system. A dynamically stable channel, therefore, acknowledges that the inner portion of the active channel may be rearranged during flow events, but overall the sediment loads entering the channel are equal to those leaving it. This accounts for the inevitable shifts within the active channel, setting a realistic goal of the channel as stable, but NOT static.

In contrast, an unstable channel is one in which deposition requires regular removal to protect channel capacities and habitat or fish passage; or one in which the banks are collapsing or the bed is eroding down at a rapid rate.

The active channel acts in concert with an adjacent floodplain or overflow area (the "active-channel floodplain") – within the flood conveyance corridor. This flatter area allows flows larger than the active channel to spread out, but continue to flow downstream. This dissipates the erosive energy while yet conveying large quantities of water. In a multi-phase channel, this active-channel floodplain is an important part of the flood conveyance corridor. Our understanding of this "active-channel floodplain" is quite different from the larger 1% floodplain regulated by FEMA and typically developed with roads and structures. For a typical system, the active channel is expected to overbank once every year or two onto its adjacent active-channel floodplain. When these high flows expand onto the active-channel floodplain, flow is slowed and the intense hydraulic energy is allowed to dissipate without causing damaging erosion to the sidewalls of the active channel or the adjacent floodplain area.

The criteria for this objective focus on this important relationship, assessing overall whether a channel has been properly designed to manage both the rare large events and the smaller, more ordinary flows, and whether energy will be dissipated by the configuration of the channel without causing erosion or flood damage to developed areas.

The criteria contained in this section are based on accepted models of geomorphology. We have relied heavily on the San Francisco Bay Regional Water Quality Control Board's Technical Reference Circular W.D. 02-#1 "A Primer on Stream and River Protection for the Regulator and Program Manager" in formulating the criteria for this objective. However, important caveats apply as some of the more generic concepts are not relevant to all Santa Clara County creeks. **The particulars of many of the criteria in this section are intended to be adjusted on a case-by-case basis to better reflect local conditions, as they become better understood and described.**

For example, many Santa Clara Valley rivers and creeks are naturally and deeply incised into the broad alluvium deposited by these same rivers during a previous (much wetter) period. When streams are naturally incised, the meaning of "bankfull" is not completely clear, nor is the concept of a floodplain at "bankfull height".

It has been suggested that project alternatives should be assessed by a qualified geomorphologist who is well-versed in local conditions and local geology including knowledge of faulting, subsidence, incision (whether natural or human-induced), historic sea level changes, sediment load changes, rainfall quantity changes, tidal processes and a range of other local particulars. This level of expertise may be difficult to come by, but checking with District and project team geologists and geomorphologists would be a good start.

Similarly, appropriate design of a well- functioning channel system requires a thorough understanding of those same systems from the very beginning of the planning process. Collection and analysis of hydrologic, geomorphic and geologic data specific to the watershed under study is critical to properly applying geomorphic principles to a project design. The criteria contained in this section are based on the assumption that such data collection and analysis has occurred and the system is well understood. When the word "appropriate" is used within this criteria rating system, it refers to this level of understanding of the watershed system.

Collectively, the criteria for this objective measure whether a properly sized active channel is integrated with an active-channel floodplain to provide sediment conveyance and energy dissipation, whether the size and planform of the active channel is appropriate to the overall valley slope, whether the project transitions smoothly to adjacent reaches and whether sideslopes are stable by design. Individual criteria are:

3.1. Floodplain (35)
Inclusion of an appropriately-sized overflow area within the flood conveyance corridor that effectively conveys high flows and dissipates erosive energy (floodplain or "multi-stage" channel)

3.2. Active channel (30)
Appropriateness of size and configuration of the active channel relative to watershed inputs and reach characteristics

3.3. Stable side slopes (20)
Stability of channel side slopes using geotechnical or biotechnical methods

3.4. Upstream/Downstream Transitions (15)
Stability of channel's integration with upstream and downstream reaches

Appendix B-3 provides additional notes and information on this topic.

Objective 3: Integrate physical stream functions and processes

C3.1 Floodplain

Assesses: Inclusion of an appropriately-sized overflow area (adjacent floodplain) within the flood conveyance corridor that conveys high flows and dissipates erosive energy ("multi-stage" channel)

Rating Guidance

● Outstanding	◕ Very Good	◒ Adequate	◔ Fair	○ Poor	X Unacceptable

●	Active channel is hydraulically connected to a floodplain at properly sized bankfull level. Properly sized means that sediment transport is accomplished effectively in the active channel (i.e. sized for the dominant sediment discharge) and that higher flows spread onto and flow along the adjacent floodplain. This allows dissipation of hydraulic energy and downstream conveyance of larger quantities of water, up to the design flow. The floodplain is parallel to the conveyance channel, and serves to convey (not merely store) high flows. AND Overflow area (floodplain) is adequate in width to significantly mitigate the erosive forces of the flowing water against the beds and banks through reduction of velocity and shear stress within the active channel and along the floodplain itself.
◒	Modified floodplain: Multi-stage channel (a smaller channel within a larger channel) allows expansion of flows higher than approximately ¼ to 1/3 of the design flow by providing additional flow area (modified floodplain); but limited right-of-way requires that setback levees or other containment means are necessary. Multi-stage channel means there is a smaller channel sized to convey sediment and ordinary flows within a larger channel sized to convey the design flow. The larger channel may not be wide enough to completely mitigate shear stress for design flows (e.g. 1%), as with an Outstanding alternative, but the ability of moderate to high flows to spread out beyond a tightly confined single-phase channel provides some relief from erosive forces. OR Bypass channel is used to convey high flows, effectively diverting erosive energy from main channel.
○	Flow will not spread out laterally (overflow onto floodplain or second-phase channel) until at least ½ of design flow (e.g. 1%) is reached. Multi-stage channel, but not at bankfull level.
X	Single-phase channel (no separate active channel, no floodplain of any size) sized to convey design flow (e.g. 1% flow). Channel has flat bottom. Levees or floodwalls are required to convey design flow and are not set back from the top of bank.

Objective 3: Integrate physical stream functions and processes

C3.2 Active Channel

Assesses: Appropriateness of size and configuration of the active channel relative to watershed inputs and reach characteristics

Rating Guidance

● Outstanding	◕ Very Good	◒ Adequate	◔ Fair	○ Poor	X Unacceptable

●	Design includes dynamically stable active channel with appropriate dimensions (width, depth, slope, length and meander parameters) All of: a) Active channel is appropriately matched to valley slope with geomorphically appropriate level of sinuosity. b) Meander length is appropriately related to active channel width for its watershed (Riley suggests a meander length of 8 to 11 x active channel width is appropriate to East and North SF Bay Area. This can serve as a starting point. Data specific to the South Bay will allow SCVWD to more appropriately customize this range in the future). c) Meander curve radii are appropriate to channel width and valley slope. (Riley suggests radius value of 2.3 x active channel width (or within the range of 1.5 to 4.5 x) for East and North SF Bay streams. This may be used as a starting point for defining appropriate South SF Bay range). d) Meander amplitudes are appropriate to channel width and valley slope. (Riley suggests 2.7 x active channel width for North and East SF Bay streams. This may be used as a starting point for defining appropriate South SF Bay range). e) Sufficient right-of-way accommodates full meander belt width for properly designed active channel width and meander amplitude[1]. (Riley provides a belt width ≈ 3.7 x active channel width for East and North SF Bay streams. This may be used as a starting point for defining an appropriate South SF Bay range) f) Active channel is properly sized to effectively convey expected sediment load (tidal and/or fluvial). Q(sediment) in = Q(sediment) out. g) Active channel bed is mobile and substrate size is locally appropriate and diverse, based on location within the watershed and hydraulic energy of channel location (e.g. pool vs. point bar). h) Pool-riffle sequence is present (if appropriate to position in the watershed) and based on appropriate geometry – spacing, slope, depth of pools. i) Tidal processes are fully accounted for, including range of tidal prism flows and tidal sedimentation processes. j) Control structures are unnecessary within active channel.

[1] Based on flows, slope and width/depth ratio

◒	Active channel is incorporated into design, but site constraints (such as channel entrenchment, private property, adjacent roadways, environmental or other regulatory requirements) prevent construction of a fully-functioning active channel, as described above. Allowances may be made as follows: a) Stable active channel width and depth are not compromised. b) Active channel length is at least 80 percent of calculated stable length. c) Compromised slope (oversteepened) is mitigated with small drops (e.g. rock weirs less than 18 inch drop). d) Outside of channel bends are protected (most likely by rock -- RWQCB, Riley p. 92) e) Meander curve radii are within normal range for local conditions (Riley suggests a value of 2.3 or within the range of 1.5 to 4.5 X active channel width for North or East SF Bay streams.) f) For extremely limited right-of-way, hardscaped near-vertical walls are used to maximize planform space for flowage, active channel meander and near-stream vegetation (Riley p.91). g) In highly confined creeks, large roughness elements (boulders, logs) used to force pool/bar development if appropriate (see Montgomery Buffington 1997)
○	Active channel is incorporated into the plan, but due to lack of data or significant site constraints, it is unknown whether it will be fully functioning in its ability to convey the dominant hydraulic and sediment discharge. Some sinuosity is incorporated into channel design, but significantly less than or more than the calculated requirement for the reach. Hydraulic control structures, using hardscape, are required for stability of structure.
X	No separate active channel is incorporated into alternative plan. Right-of-way would not accommodate any meander for active channel, necessitating a straight-line channel. Design includes one or more of the following: Flat bottom; fixed bed; straight-line; uniform slope.

Objective 3: Integrate physical stream functions and processes

C3.3 Stable Side Slopes	Assesses: Stability of side slopes using geotechnical or biotechnical methods

Rating Guidance	
● Outstanding ◕ Very Good ◒ Adequate ◔ Fair ○ Poor X Unacceptable	
●	All channel side slopes are stable through use of proper side slope ratios appropriate to the geologic materials and expected detrimental forces including hydraulic shear, gravity, overland flow, etc.
◒	Side slopes are protected from instability through biotechnical means (e.g. log crib walls with willows, root wads, willow wattles).
○	Side slopes are protected using hardscape (vegetated hardscape– e.g. planted rip-rap would earn a “fair” rating).
X	Channel side slopes (either active channel or conveyance channel) are unstable and unprotected and subject to failure from anticipated adversary forces.

Objective 3: Integrate physical stream functions and processes

C3.4 Transitions

Assesses: Stability of channel's integration with upstream and downstream reaches

Rating Guidance

● Outstanding ◕ Very Good ◒ Adequate ◔ Fair ○ Poor X Unacceptable

●	Channel bottom is integrated so that it transitions seamlessly with stable upstream and downstream reaches. Transitions are achieved without abrupt changes in grade or direction of flow.
◒	Transition to upstream and/or downstream elevations require a stabilizing grade control. Grade control structures are limited to around 18 inch drop and minimally hardscaped (e.g. rock weirs).
○	Existing infrastructure at upstream and/or downstream ends require a hardscaped grade control structure with a drop greater than about 18 inch. Fish passage is provided separately.
X	Reaches upstream and/or downstream of the project are unstable and transitions between project reach and adjacent reach(es) are not designed for long-term stability.

Objective 4

Minimize Maintenance Requirements

In support of Board policy to protect flood control facilities as important assets and to avoid spending inefficiently, this objective focuses on the long-term obligation of operating and maintaining capital projects once they are constructed. Incorporating knowledge and experience from previous projects into the planning and design of new ones applies continuous improvement principles and helps to minimize hard-to-maintain design features. Incorporating this concept suggests early collaboration between the planning team and district field-experienced maintenance workers.

Reducing maintenance requirements by design will also reduce permitting and mitigation requirements, resulting in an even greater savings over the long-term. Furthermore, a project that by design has few long-term maintenance requirements will have an increased performance reliability; this is particularly important when future, long-term funding is uncertain.

This objective recognizes that time and effort applied at the beginning of the planning process to design *out* maintenance will result in positive payback many times the original effort. Not solely a maintenance and operations issue, taking such an approach optimizes several other performance factors, including reliability, durability and life-cycle costs, producing tangible cross-benefits for the creek project as a whole. Such an approach might also support habitat objectives by reducing the intensity of human intervention within sensitive riparian corridors.

The criteria for this objective assess: anticipated maintenance requirements due to structural features such as culverts, bridges or grade control; how well natural processes have been accounted for in the design so that activities such as sediment removal or erosion protection are minimized; how well the project can handle water and sediment flows from more frequent, smaller-than-design flows; and finally whether the project plan provides adequate access for maintenance crews and equipment on those occasions when maintenance would be required.

An outstanding project design would minimize long-term efforts required to keep the project functioning as designed. Individual criteria are:

4.1. Structural Features (25)
Maintenance requirements associated with structural features within project corridor

4.2. Natural Processes (25)
Maintenance requirements associated with vegetation growth, erosion and sediment processes

4.3. Urban flows (25)
Maintenance requirements resulting from smaller, high-frequency storm events and outfall flows

4.4. Access (25)
Incorporation of adequate access for maintenance crews and equipment

Appendix B-4 provides additional notes and information on this topic.

C4.1 Structural Features

Assesses: Maintenance requirements associated with structural features within project corridor

Rating Guidance	
● Outstanding ◕ Very Good ◒ Adequate ◔ Fair ○ Poor X Unacceptable	
●	Need for structural features that require routine maintenance has been eliminated by design.
◒	Need for structural features that require routine maintenance has been reduced compared to existing conditions by design. OR Design of required structural features accounts for and minimizes projected routine maintenance.
○	Maintenance required for structural features is roughly equivalent to existing conditions.
X	Significant numbers of structural features, requiring routine maintenance are incorporated into design. AND/OR More structural features than under existing conditions.

Objective 4: Minimize maintenance requirements

C4.2 Natural Processes

Assesses: Maintenance requirements associated with vegetation growth, erosion and sediment processes

Rating Guidance

Outstanding	Very Good	Adequate	Fair	Poor	X Unacceptable

●	a) Expected (modeled) sediment deposition and vegetative growth for 100 plus years will not cause flows to exceed the design capacity including appropriate freeboard. b) Stream bank erosion requiring repairs is not expected. c) Conveyance channel incorporates floodplain area to minimize erosive velocities. (This could be addressed by incorporating a sediment transporting (active or bankfull) channel with a floodplain OR by providing excess capacity).
◒	a) Expected (modeled) sediment deposition and vegetative growth for 10 plus years will not cause flows to exceed the 1 percent capacity. b) Some erosion is expected, but emergency erosion repairs will not be necessary. c) Channel incorporates multi-phase channel design or bypass to alleviate high velocity, erosive flows in the main conveyance channel.
○	a) Expected (modeled or estimated) maintenance cycle for capacity restoration for sediment or vegetation in any one area is three or less years. b) Maintenance guidelines provided so that locations of sediment maintenance are known, although frequency is not. c) Alternative incorporates few if any areas where high flows are able to spread out and reduce velocities/erosive forces.
X	a) Sediment, erosion potential and vegetation growth not modeled or otherwise accounted for. b) Yearly maintenance expected or probable. c) Channel is single-phase with no floodplain or secondary channel to relieve high flow pressure.

Objective 4: Minimize maintenance requirements

C4.3 Urban Flows

Assesses: Maintenance requirements resulting from smaller, high-frequency storm events and outfall flows

Rating Guidance	
● Outstanding ◕ Very Good ◒ Adequate ◔ Fair ○ Poor X Unacceptable	
●	Maintenance requirements from urban flows would be significantly reduced. For example: • Outfalls are designed to reduce erosion and sedimentation to a level that maintains a stable channel geometry (for example, outfalls are set back from active channel). • Offstream detention would significantly reduce in-stream sedimentation/erosion impacts. • Design addresses grade control to prevent incision and erosion.
◒	Maintenance requirements from urban flows would be somewhat reduced.
○	Maintenance requirements from urban flows would be about the same or worse.
X	• Outfalls will contribute to excessive erosion and sedimentation in the channel. For example, high-output outfalls are placed at right angles to bank and flow directly into channel with no transition zone between outfall and creek flow. • No offstream detention of stormwater, causing accelerated hydromodification of channel. • Design does not address channel incision and/or bank erosion.

Objective 4: Minimize maintenance requirements

C4.4 Access	Assesses: Incorporation of adequate access for maintenance crews and equipment

Rating Guidance	
● Outstanding ◕ Very Good ◒ Adequate ◔ Fair ○ Poor X Unacceptable	
●	Alternative provides multiple function access corridors and access points, optimized based on an analysis of projected maintenance activities and required maintenance equipment. For example, one extra-wide road might provide equipment access superior to two standard-width roads.
◒	Access corridors comply with district policy 3-410 of Engineering Policies & Procedures, dated March 1992 and approved by the board October 1972.
○	Access corridors are provided, but do not comply with district policy 3-410 of Engineering Policies & Procedures, dated March 1992 and approved by the board October 1972.
X	Alternative provides inadequate or no access for maintenance crews and equipment.

Objective 5

Integrate within the watershed

This objective measures how well a project is integrated into its watershed as a whole. This objective is consistent with the District's mission of watershed stewardship and protection. Integration within a watershed context implies an understanding of watershed processes – physical, ecologic and social – and how appropriate a project is to its location within the watershed and those processes. These understandings must look beyond the current condition to projected changes in the watershed from natural or human-induced alterations.

Physical processes include watershed inputs and downstream receptors including hydrologic, geologic and tidal influences. Successful integration of these processes is largely measured by objective number three. Ecologic processes include understanding the historic and current potential for successful ecologic systems within the watershed and at the project location. These are largely measured by objective number two. Social processes include understanding and meeting the desires of the various communities that we serve. These are measured with objectives seven and eight. Integrating within the watershed also means that a project does not create negative impacts to upstream or downstream reaches in terms of flooding, maintenance requirements, the sediment balance, ecological conditions or water quality.

In many ways, this objective encompasses the goals implied by all of the other objectives combined. For that reason, there is a single criterion that simply measures whether the local watershed processes are understood and if a project has been shaped to work with, and not against, those processes.

5.1. Meets local watershed goals (100)

Ability to meet watershed goals as defined in a process that examines the watershed as a whole and accounts for opportunities and constraints specific to the project area.

Objective 5: Integrate within the watershed

C5.1 Meets Local Watershed Goals

Assesses: Ability to meet watershed goals as defined in a process that examines the watershed as a whole and accounts for opportunities and constraints specific to the project area

Rating Guidance	
● Outstanding ◕ Very Good ◒ Adequate ◔ Fair ○ Poor X Unacceptable	
●	The alternative substantially advances watershed goals established as described above.
◒	The alternative advances some watershed goals, and is not in conflict with any watershed goals established as described above.
○	The alternative conflicts with more than one major watershed goal established as described above.
X	The project is in conflict with a number of watershed goals established as described above. OR Watershed goals have not been created.

Note: An example of watershed goals are those that could be defined through a watershed stewardship planning process specific to the watershed and/or creek under study. For example, in 2005 the District completed a watershed stewardship planning processes for the Lower Peninsula, West Valley and Guadalupe Watershed areas, with specific watershed investigations and plans for Calabazas, Stevens and Alamitos Creeks in those watersheds. In 2002, a Watershed Stewardship Plan was developed for the Coyote Watershed. In 2005, an historical ecological survey was completed for Santa Clara Valley, with emphasis on Coyote Creek watershed and the Baylands. **These documents should provide adequate context.**

Other documents could be used by the project team to understand local goals in order to establish an appropriate context in which to evaluate.

Objective 6

Protect the quality and availability of water

This objective addresses a core District mission: ensure clean, safe water in our creeks and bays. The nexus between flood protection and water supply is often overlooked, but with over half of the District's annual water supply stored in local aquifers, the connection between flowing creeks, groundwater recharge and water supply is clearly evident. Similarly, the active role that a natural creek plays in water quality protection has long gone unseen. Recent guidance provided by the San Francisco Bay Region Water Quality Control Board highlights the role of a properly functioning creek corridor in protecting and even improving surface water quality (See Technical Reference Circular W.D. 02-#1 "A Primer on Stream and River Protection for the Regulator and Program Manager; October 2002).

Protecting the local quality and availability of water provides cross-benefits for objective 2, which measures ecologic quality and for objective 8, which assesses benefits to the community, including recreation and aesthetics. Many of the physical and riparian vegetative features that support instream water quality also improve performance of other objectives, such as objective 3 which assesses geomorphic stability and again, objective 2, which assesses support of the ecologic system.

The criteria for this objective collectively assess how well a project would support water-supply related goals of the district, including quantity and quality of surface and groundwater. Assessments include whether the project has taken the recharge potential of the site into account; whether instream water quality will be maintained or improved via features that mix, aerate and filter the water as it flows to and through the project corridor; whether the potential to reduce the impacts of urban development have been incorporated into the project and whether any proposed alteration of the natural flow regime would impact biologic or geomorphic processes.

Overall, these four metrics assess the impact that a proposed project would have on the quality and availability of water – both surface water and groundwater. Individual criteria are:

6.1. Water Availability (30)
Impact on ground-water recharge

6.2. Groundwater Quality (30)
Groundwater quality protection from contamination and the threat of contamination by preventing contamination entry into groundwater

6.3. Instream Water Quality (25)
Water quality protection through vegetation and instream hydraulic complexity

6.4. Offstream Water Management (10)
Ability to enhance water supply and quality and reduce peak flows through local retention of rainfall and pollution prevention programs

6.5. Flow Regime (5)
Ability to maintain geomorphically and biologically appropriate range of flows – Quantity and Timing

Objective 6: Protect the quality and availability of water

C6.1 Water Availability

Assesses: Impact on groundwater recharge

Rating Guidance

● Outstanding	◕ Very Good	◒ Adequate	◔ Fair	○ Poor	X Unacceptable

●	a) Alternative would result in a net increase in recharge potential (i.e. increased perviousness in SCVWD-mapped recharge zones). b) Alternative would improve functionality or performance of water rights diversions.
◒	a) No net change in potential recharge for the project area. b) Existing diversions or water rights are not negatively impacted by alternative.
○	a) Alternative would reduce the potential for recharge in the project area (i.e. decrease perviousness in SCVWD-mapped recharge zones). b) Existing diversions or water rights are not negatively impacted by alternative.
X	a) Alternative substantially reduces or eliminates the existing potential for recharge in the project area. b) Alternative would degrade performance of diversions or exercising water rights.

Objective 6: Protect the quality and availability of water

C6.2 Groundwater Quality

Assesses: Groundwater quality protection from contamination and the threat of contamination by preventing contamination entry into groundwater

Rating Guidance

● Outstanding	◕ Very Good	◒ Adequate	◔ Fair	○ Poor	X Unacceptable

●	Alternative maintains the minimum required separation for natural protection of groundwater and contains elements that: • Provide structural features with ongoing maintenance to prevent contaminant entry into groundwater; and • Incorporate best management practices (e.g., vegetated swales) with ongoing maintenance; and • Incorporate outreach, education, or other programs that would result in a decrease of pollution potential
◒	Alternative does not maintain the minimum required separation for natural protection of groundwater, however alternative contains elements that: • Provide structural features with ongoing maintenance to prevent contaminant entry into groundwater; and • Incorporate best management practices (e.g., vegetated swales) with ongoing maintenance
○	Alternative does not maintain the minimum required separation for natural protection of groundwater, however alternative includes best management practices with ongoing maintenance.
X	Alternative does not maintain the minimum required separation for natural protection of groundwater and does not include measures or programs to protect groundwater quality.

Notes:

1. Minimum required separation for natural protection of groundwater refers to the thickness of the unsaturated zone from the infiltration point to the highest seasonal water table. The minimum required separation is established by the Board of Directors through resolution or by District policies in consultation with the Groundwater Management Unit in the absence of a board resolution.

2. Best Management Practices refer to measures that remove or reduce pollutants from stormwater prior to groundwater infiltration (see Santa Clara Valley Urban Runoff Pollution Prevention Program C.3 Stormwater Handbook, the Bay Area Stormwater

Management Agencies Association “Start at the Source” and/or the California BMP Handbooks).

Objective 6: Protect the quality and availability of water

C6.3 Instream Water Quality

Assesses: Water quality protection through vegetation and instream hydraulic complexity

Rating Guidance

Outstanding | Very Good | Adequate | Fair | Poor | X Unacceptable

●	a) Alternative would likely improve instream water quality by creating a hydraulically complex channel and including native riparian vegetation (reference SCVWD-approved list) in appropriate locations to achieve significant benefits to water quality: • Filter pollutants --- protective buffer strip of low, brushy, grassy vegetation on banks and/or in floodplain to slow and filter overland flows. • Moderate temperatures --- near-stream or canopy-forming vegetation (shaded riverine aquatic). • Stabilize the stream banks with (live) root mass. • Provide aeration, shade, filtering, mixing and stream bank erosion protection through large- or small-scale hydraulic roughness elements (Scale refers to discrete in-channel features (small-scale), vs. configuration of channel itself (large-scale)) • Concentrate low flows within a smaller, defined channel to reduce stagnant water and maintain temperature, dissolved oxygen and provide vector control. b) Vegetation system provides above values short-term and long-term after construction.
◒	a) Alternative would likely maintain current water quality conditions through the use of appropriate vegetation and hydraulically complex instream elements. b) Vegetation would likely take more than five years to re-establish and provide water quality benefits.
○	Alternative would reduce streamside vegetation and instream hydraulic complexity as compared to existing conditions, likely resulting in a reduction in water quality protection.
X	Alternative would provide no vegetation or would result in significant loss of streamside and buffer vegetation. Alternative would provide little or no hydraulic complexity to enhance aeration, shade or other water quality parameters.

Objective 6: Protect the quality and availability of water

C6.4 Offstream Water Management

Assesses: Ability to enhance water supply and quality and reduce peak flows through local retention of rainfall and pollution prevention programs

Rating Guidance

Outstanding	Very Good	Adequate	Fair	Poor	X Unacceptable

●	Alternative contains elements that, through education, incentives, physical features or other means (such as onsite detention/retention incentives): • Significantly increases retention and use of rainwater where it falls (thereby improving local water availability and reducing potential for non-point source runoff/ overland flow); and • Significantly reduces peak flows to the creeks (thereby reducing the need for flood protection); and • Incorporates programs or features that would result in a decrease of pollution potential (e.g.. discourages dumping or partners with schools) (Note: the above-elements could overlap)
◒	Alternative contains elements that, through education, incentives, physical features or other means: • Moderately or measurably increases retention and use of rainwater where it falls (thereby improving local water availability and reducing potential for non-point source runoff); and • Moderately or measurably reduces peak flows to the creeks (thereby reducing the need for flood protection); and • Incorporates programs or features that could result in a decrease of pollution potential (e.g. discourages dumping or partners with schools) (Note: these elements could overlap)
○	Alternative does not contain any such elements.
X	Alternative would discourage local capture of rainfall/runoff.

Objective 6: Protect the quality and availability of water

C6.5 Flow Regime

Assesses: Ability to maintain geomorphically and biologically appropriate range of flows – Quantity and Timing

Rating Guidance	
● Outstanding ◕ Very Good ◒ Adequate ◔ Fair ○ Poor X Unacceptable	
●	Alternative maintains locally appropriate seasonal variation in flows (quantity and timing) that will support an appropriate physical channel configuration and locally-appropriate species.
◒	Alternative includes modifications to the locally-appropriate flow regime (quantity and timing of flows). These variations have been assessed and would produce no significant impact on the physical channel stability or the locally-present species.
○	Alternative includes significant modifications to the natural, locally-appropriate flow regime in terms of seasonal variation in timing and quantity of flow. This modification is likely to have an impact on the channel stability and/ or locally-present biota.
X	Alternative includes significant modifications to the natural, locally-appropriate flow regime in terms of seasonal variation in timing and quantity of flow. This modification is likely to have a significant impact on the channel stability and/ or locally-present biota.

Objective 7

Cooperate with other local agencies to achieve mutually-beneficial goals

The District provides flood protection within Santa Clara County, yet local jurisdictions hold land-use authority. Any flood protection project has the potential to significantly influence surrounding land uses – positively or negatively. Conversely, surrounding land uses and jurisdictional plans can significantly influence the possibilities for providing flood protection. A project developed under a positive partnership with a city can unite a local community and provide many possible benefits to the region. These include development and use of parkland and open space; increased science and exploration opportunities for schools; increased real estate values attributable to greenbelt quality or encouraging visitors to the area to the benefit of local businesses. A poorly planned project may forfeit those potential benefits and even face opposition from the community. To maximize benefits to the community, the District and local jurisdictions should collaborate early in the process to identify common goals and visions.

This objective measures how effectively a potential project meets goals of both the District and its partner communities affected by the project. This can only be achieved through effective communication and collaboration between the District and the local jurisdiction(s). The criteria measure whether a potential project meet specific goals outlined through a project-specific partnership as well as whether it supports the long-standing goals of the municipality as established in its general plan.

Individual criteria are:

7.1. Mutual local goals (50)

Ability to achieve the project-specific goals and objectives developed jointly by the District and local agencies.

7.2. Supports general plan (50)

Ability to support goals and policies as stated in general plan of partner agencies.

Objective 7: Cooperate with other local agencies to achieve mutually beneficial goals

C7.1 Mutual Local Goals

Assesses: Ability to achieve the project-specific goals and objectives developed jointly by the District and local agencies

Rating Guidance	
● Outstanding ◕ Very Good ◒ Adequate ◔ Fair ○ Poor X Unacceptable	
●	All goals and objectives developed in the memorandum of consensus[2] (MOC) of all involved agencies are met.
◒	Some goals and objectives developed in the memorandum of consensus of all involved agencies are met.
○	A memorandum of consensus is developed, but only district goals and objectives are met.
X	Few if any objectives of any agency met. OR No memorandum of consensus was developed for the project.

Objective 7: Cooperate with other local agencies to achieve mutually beneficial goals

[2] A memorandum of consensus (or similar agreement) is developed in a Local Agency Inclusion Process – See Appendix B-7

C7.2 Supports General Plan	Assesses: Ability to support goals and policies as stated in general plan of partner agencies

Rating Guidance	
● Outstanding ◕ Very Good ◒ Adequate ◔ Fair ○ Poor X Unacceptable	
●	Supports all pertinent general plan elements.
◒	Supports some pertinent general plan elements.
○	Does not support general plan elements. Some conflicts with general plan elements.
X	Significant conflicts with major elements of the local agencies' general plan.

Objective 8

Community benefits beyond flood protection

> *"Increasingly, floodplains are seen as valuable resources by our society. They provide opportunities for flood protection, agricultural production, open space, valuable native habitat, ecosystem protection, recreation, economic development, and housing."* California Floodplain Management Task Force; Final Recommendations Report, 2002.

Multi-objective planning for flood protection projects – providing additional societal benefits beyond flood protection -- is reflected in Board policies calling for an enhanced quality of life in Santa Clara County and additional open spaces, trails and parks along creeks.

The criteria that measure this objective represent the full range of community benefits beyond flood protection that might be integrated into a creek project. These include safety, recreation, education, aesthetics, open space, economic benefits, cultural benefits, efficient use of resources, and other community desires. Meeting these criteria will require extensive communication with the local community. Most of the criteria are subjective, and the community itself will likely provide the best guidance as to whether the criteria, and the objective as a whole, would be met by an alternative. The planning team should also anticipate *future* needs of the local community and allow for appropriate project elements to support these needs. Individual criteria are:

8.1. Community safety (15)
Overall safety for appropriate access and recreation

8.2. Recreation (20)
Quality of recreation experience provided by alternative

8.3. Aesthetics (15)
Quality of aesthetic form provided by alternative

8.4. Social and cultural benefits (5)
Opportunity through programs or physical features to promote community involvement

8.5. Local economic effects (10)
Potential effects on property values and/or local business climate

8.6. Green construction and operation (10)
Reflection of the District's commitment to minimize its impact on the environment

8.7. Open space (10)
Incorporation of open space into alternative design

8.8. Community input (15)
Alternative reflects community-developed objectives / ideas

C8.1 Community Safety	Assesses: Overall safety for appropriate access and recreation

Rating Guidance	
● Outstanding ◕ Very Good ◒ Adequate ◔ Fair ○ Poor X Unacceptable	
●	All safety issues identified by public safety officials during their review of the alternative are addressed.
◒	Most safety issues identified by public safety officials during their review of the alternative are addressed. Project team provides an explanation of features deemed to be inappropriate or infeasible.
○	Few if any of the recommendations are incorporated into the proposed alternative.
X	The alternative was not reviewed by public safety officials to evaluate safety concerns.

Objective 8: Community benefits beyond flood protection

C8.2 Recreation

Assesses: Quality of recreation experience provided by alternative

Rating Guidance	
● Outstanding ◕ Very Good ◒ Adequate ◔ Fair ○ Poor X Unacceptable	
●	Area provides unique, quality recreational opportunities or a variety of opportunities including active and passive recreation in an area that is otherwise lacking in similar recreational opportunities. Area is highly accessible to the public and provides related amenities. Facilities are incorporated into existing recreational facilities and the surrounding community.
◒	Some recreational facilities incorporated into alternative. Access may be limited.
○	Few or no recreational facilities incorporated into alternative. Access may be limited and related amenities to support the recreational facilities may be inadequate (for example, inadequate parking, no public transportation, no restrooms).
X	Existing recreational activities are removed as a result of the alternative. Recreational opportunities could have been, but are not, incorporated into the alternative.

Objective 8: Community benefits beyond flood protection

C8.3 Aesthetics	Assesses: Quality of aesthetic form provided by alternative

Rating Guidance	
● Outstanding ◕ Very Good ◒ Adequate ◔ Fair ○ Poor X Unacceptable	
●	This is a qualitative assessment. Some features to consider include: • Harmonizes with the landscape • Emulates / creates natural environment including sound (birds, water); meander; smell (natural earth, water) • Unexpected large / small features • Concrete may be colored or sculpted to look like natural rock • Park-like, natural-like • Art, informal art, locally appropriate art • Amenities – benches • Clever • Follows “Coyote Watershed Aesthetic Guidelines” for project features, as applicable (SCVWD, Dec 2000)
X	• Hardscape significantly greater than greenscape • Visual monotony • Heavy use of non-aesthetically treated concrete

Objective 8: Community benefits beyond flood protection

C8.4 Social and Cultural Benefits

Assesses: Opportunity through programs or physical features to promote community involvement

Rating Guidance	
● **Outstanding** ◕ **Very Good** ◒ **Adequate** ◔ **Fair** ○ **Poor** **X** **Unacceptable**	
●	The alternative design includes appropriate infrastructure to support the full range of social and cultural benefits identified in an analysis of the site and the needs of the surrounding community.
◒	The alternative design includes appropriate infrastructure to support some social and cultural benefits identified in an analysis of the site and the needs of the surrounding community.
○	The alternative design does not include the appropriate infrastructure to support social and cultural benefits identified in an analysis of the site and the needs of the surrounding community.|
X	The alternative eliminates existing social or cultural features Or The alternative includes inappropriate social or cultural features

Objective 8: Community benefits beyond flood protection

C8.5 Local Economic Effects

Assesses: Potential effects on property values and/or local business climate

Rating Guidance	
● Outstanding ◕ Very Good ◒ Adequate ◔ Fair ○ Poor X Unacceptable	
●	• Probable increase in value of adjacent and neighboring properties as measured by real estate industry standards. • Commercial benefits to local business such as increased / improved pedestrian access as measured through city economic development offices (usually affiliated with chambers of commerce). • Alternative increases development possibilities.
◒	No measurable change to property values or local businesses.
○	• No measurable change to property values. • Local businesses negatively impacted by alternative.
X	• Decrease in value of adjacent and neighboring residential properties as measured by real estate industry standards. • Commercial access decreased in the long-term.

Property values notes:

Some projects that have analyzed property value impacts include the Los Capitancillos study, County Parks info on trails, and the Coyote Valley Greenbelt Plan. Other greenbelt areas would have similar studies.

The National Park Service has produced a Resource Book: "Economic Impacts of Protecting Rivers, Trails and Greenway Corridors." This includes a chapter on Real Property Values, which cites examples and provides guidance to analyzing the likely increase in property values due to proximity to a greenbelt/ parkway corridor. Document available for downloading at: http://www.nps.gov/pwro/rtca/econ_index.htm

Objective 8: Community benefits beyond flood protection

C8.6 Green Construction and Operation

Assesses: Reflection of the District's commitment to minimize its impact on the environment

Rating Guidance	
● Outstanding ◕ Very Good ◒ Adequate ◔ Fair ○ Poor X Unacceptable	
●	A variety of features and methods are incorporated into the alternative to minimize resource use: • Water -- native plant landscaping, innovative turf technology for sports fields or lawn areas, recycled water use for irrigation. • Raw materials -- trails and structures made of re-used, renewable, or recycled material, materials from local resources. • Energy -- conservation, alternative energy such as solar and wind – e.g. for lighting, construction • Top soil stockpiled and re-used. • Plants from local seed/stock, preferably from the same watershed.
◒	Some features and methods are incorporated into the alternative to minimize resource use – either during construction or of the completed project.
○	Missed opportunities for minimal resource use (for example: irrigating hydrophilic exotic landscaping with potable water, native materials discarded and new replacement materials brought in).
X	Alternative would significantly increase non-renewable resource use over existing conditions and for the long term.

Objective 8: Community benefits beyond flood protection

C8.7 Open Space

Assesses: Incorporation of open space into alternative design

Rating Guidance	
● Outstanding ◕ Very Good ◒ Adequate ◔ Fair ○ Poor X Unacceptable	
●	• The alternative ensures continued long-term protection of existing protected open space. • Alternative creates new open space. • Alternative protects existing open space that is/will be subject to development in the near future, taking advantage of opportunities to provide open space in anticipation of future development pressures or anticipated local growth.
◒	The alternative reserves existing open space within the project area.
○	Existing open space would be degraded by the alternative.
X	Significant amount of existing open space would be lost.

Objective 8: Community benefits beyond flood protection

C8.8 Community Support

Assesses: Alternative reflects community-developed objectives/ ideas

Rating Guidance	
● Outstanding ◕ Very Good ◒ Adequate ◔ Fair ○ Poor X Unacceptable	
●	Relative to other alternatives, community indicates overwhelming support.
◒	Overall, community indicates acceptance of this alternative relative to the other alternatives.
○	Community clearly indicates a lack of support for this alternative.
X	Community finds this alternative unacceptable.

In essence, this criteria provides a combined assessment of the previous criteria under this objective, by allowing the community to voice its opinion on which features are most important and whether an alternative has addressed them.

Objective 9

Minimize life-cycle costs

While fairly straightforward to estimate, life-cycle costs are challenging to optimize. Careful attention to this objective will support Board Policy of achieving a balance between the benefits and costs of reducing the potential for flood damages. This objective also supports the Policy that requires the Chief Executive Officer to protect the assets of the agency.

Sometimes design choices that appear to save dollars during initial construction result in long-term maintenance requirements that create a significant financial burden over the lifespan of a project. Conversely, while right-of-way is frequently the most costly component of a river corridor project, the benefits of providing sufficient room for a self-sustaining geomorphic and biotic system may well pay off in the long run. Often the tradeoffs between capital and maintenance costs are not obvious, but examining project costs as a long-term investment rather than a one-time cost is the appropriate approach.

This objective does not attempt to place value on non-economic components of a project. The District has not yet developed local expertise in this emerging field of economic analysis. Neither does this objective measure the benefit:cost ratio of a project, because to provide a true assessment, non-economic components should be incorporated.

This objective measures the Net Present Value of three components of life-cycle costs: capital costs, maintenance or operations costs; and opportunities to reduce either of those costs through grant or cost-sharing opportunities. The measurement is presented not as ratings, but as dollar values. However, the dollar values could be converted to ratings by comparing any single alternative to the others under consideration.

Criteria:

9.1 Capital cost
Net Present Value of estimated capital cost

9.2 Maintenance cost
Net Present Value of all maintenance costs over the life of the project

9.3 Grant or cost-sharing opportunities
Net Present Value of grant or cost-sharing opportunities for project or project components

Criteria are not weighted – costs are simply added together in net present value format ($NPV).

Appendix B-9 provides additional notes and information on this topic.